

CHAPTER THREE:

FIELD AND HORTICULTURAL CROPS SUB-SECTORAL GOALS, PERFORMANCE AND MEDIUM-TERM RESEARCH PLANS

SORGHUM

D. A. ABA
Institute for Agricultural Research
Ahmadu Bello University
Zaria

1. INTRODUCTION

Importance and Level of Development.

All sorghums are of tropical origin and belong to the family C. Sorghum (*Sorghum bicolor* (L.) Moench) is a short day plant and hastened by short days and long nights (Doggett, 1970). In Nigeria, it is grown in the northwest, north-east, central zones, while it is moving derived savanna in the southwest zone and is being adopted into the zone. This means that it is grown in all the various sub-zones, i.e. Sahel, Northern Guinea and Southern Guinea ecologies. Presently land area for sorghum production in Nigeria is put at about 6 million hectares (Nwasike, 1987; Obilana, 1983), and a total annual production of 4.8 to 6 million tons at an average yield of 800 to 1087 kg/ha (Obilana, 1983; FAO, 1987).

In the savanna and semi-arid zones of Nigeria, sorghum is the most important cereal crop, and thus an important source of food, livestock feed and industrial raw material (Nwasike, 1982). It forms the staple food of a large part of the population in these areas, and it accounts for about 50% of the total area devoted to cereal crops including maize, rice, millet and wheat. It has been observed that in years where shortage of fertilizers are acute, more maize growing areas are planted with sorghum since it is more tolerant to poor soils.

Sorghum is used as animal feeds and a variety of traditional foods. Some of the common of these are 'ogi' or akamu, and through dry milling process products produced are used for preparing 'tuwo' and 'kunu'. The stalks are used for fencing, fuel, basket making, mats and huts, the grains are used for fermentation to alcoholic drinks (Oyenuga, 1967).

Recently, sorghum has been used industrially for various purposes

material in brewery and beverage food manufacture. Some varieties have been found to have important qualities in the making of composite flours for baking bread, biscuits, cakes and pastries in Nigeria (Obilana, 1985).

The major constraints to increased sorghum production include, drought, low soil fertility, inadequate animal traction tools/implements, pests and diseases especially stem borer, low adoption of production packages/technologies, striga (a parasitic weed).

NATIONALLY COORDINATED RESEARCH ON SORGHUM, TASK ALLOCATION

NCRP-S1

THEME 1 Breeding for early maturing varieties resistant to striga, stem borers, headbugs, grain mold and anthracnose.

- (a) Germplasm collection 1996 North-West Zone.
 - Sahel sub-zone - UDU
 - Sudan - ATBU
 - Northern Guinea - IAR
 - Central Zone
 - Southern Guinea sub-zone - F U T Minna
- (b) Germplasm evaluation - 1997
 - North-West Zone
 - Northern Guinea sub-zone - IAR & ICRISAT
- (c) Hybridization and selection - 1996
 - North-West zone
 - Northern Guinea sub-zone - IAR & ICRISAT
- (d) Evaluation of procurement of progenies
 - North-West Zone
 - Northern Guinea sub-zone - IAR, ICRISAT
- (e) Multilocational evaluation of striga-resistant variety -- 1997
 - North-West zone
 - Sahel/Sudan - UDU, ATBU

- Northern Guinea - IAR
- (f) On-farm evaluation of promising lines
 - North-West Zone. - 1997,
 - Sahel/Sudan sub-zone - UDU
 - Sudan sub-zone - ATBU
 - Northern Guinea sub-zone - IAR
 - Central zone
 - Southern Guinea sub-zone - FUT Minna
- (g) Breeders seed production
 - North-West zone - UAM
 - Northern Guinea sub-zone-IAR/ICRISAT

NCRP-S2

THEME 2: Identifying suitable forage legumes for rotation with sorghum improving of soil fertility - 1997

Tasks

- (a) Identifying/screening of promising forage/food legumes - 1997.
 - North-West zone
 - Sudan/Sahel sub-zone - UDU, Minjibi, IAR, Azare, A
 - North-West zone
 - Northern Guinea sub-zone - Samaru, IAR, Bagauda, ICR
- (b) Evaluation of the most promising and appropriate system of rotation -
 - North West zone
 - Sudan/Sahel sub-zone - UDU, Minjibi
 - North West zone - Azare, ATBU
 - Northern Guinea sub-zone - Samaru, IAR, Bagauda, ICR
- (c) On-farm evaluation of the most promising rotation system -1998
 - North-West zone
 - Sudan/Sahel sub-zone - UDU, Minjibi, IAR, Azare, A

North-West zone

Northern Guinea sub-zone — Samaru, IAR, ICRISAT

(d) Production of seeds of the promising legumes — 1997

North-West zone

Northern Guinea sub-zone — Samaru, IAR.

NCRP-S3

THEME 3: Improving Existing Animal Traction Tools for Land Preparation for Sorghum Production

Tasks

(a) Survey of existing animal-drawn tools and implements — 1997

North-West zone

Northern Guinea sub-zone — Samaru, IAR.

Evaluation of animal Traction tools — 1997.

(b) North-West zone

Northern Guinea sub-zone — Samaru, IAR.

(c) On farm evaluation of promising prototypes — 1998

North West zone

Northern Guinea sub-zone — Samaru, IAR.

(d) Modification (if necessary) based on user's identified problems -1998

North-West zone

North Guinea sub-zone — Samaru, IAR.

NCRP-S4

THEME 4: On-farm testing of improved production packages and economics of production studies

Tasks

(a) Identifying improved production packages for sorghum production - 1996

North-West zone

Sudan/Sahel sub-zone — UDU, Danbata, IAR, Saha-IAR,

(b) On-farm evaluation of improved packages for sorghum production

North-West zone

Sudan/Sahel sub-zone — UDU

Northern Guinea sub-zone — Saye, Danbata, IAR

Northern Guinea sub-zone — Samaru, IAR

Central Zone

Southern Guinea sub-zone — FUT Minna

South-West zone

Southern Guinea sub-zone — IAR & T

(c) Modification of packages/component technology where necessary

North-West zone

Sudan/Sahel sub-zone — UDU

Northern Guinea sub-zone — IAR

Central zone

Southern Guinea sub-zone — FUT Minna.

(d) Studying existing marketing and price structure and suggesting suitable measure for enhanced income — 1997.

North-West zone

Sudan/Sahel sub-zone — UDU

Northern Guinea sub-zone — Samaru, IAR

Central zone

Southern Guinea sub-zone. — FUT Minna

NCRP-S5

THEME 5: Develop legume-based crop rotation system with sorghum

(a) Surveying/identifying legume-based rotation system with sorghum —

North-West zone

Northern Guinea sub-zone — Samaru, IAR, ATB

Central zone — ICRISAT

Southern Guinea sub-zone — FUT Minna.

(b) Multiplication and maintenance of suitable legumes for the sustainable production of sorghum, 1998.

North-West zone

Northern Guinea sub-zone — Samaru, IAR, ICRISAT

(c) Evaluating appropriate rotation systems acceptable to the farmers -1998.
North-West zone

Northern Guinea sub-zone — Samaru, IAR, ATBU
Central zone — ICRISAT.
Southern Guinea sub-zone — FUT Minna.

(d) On-farm testing of the package — 1998
North-West zone — 1999
Northern Guinea sub-zone — Samaru, IAR, ATBU.
Central zone — ICRISAT
Southern Guinea sub-zone — FUT Minna.

NCRP-56: Conducting of sowing dates and planting pattern experiments.

Tasks

- (a) Determining optimum sowing dates for sorghum/legume mixture -1997
North-West zone — ICRISAT
Sudan/Sahel sub-zone — UDU, IAR.
Northern Guinea sub-zone — ATBU, IAR
Central zone — ICRISAT
Southern Guinea sub-zone — FUT Minna, IAR & T.
- (b) Determining optimum plant arrangement for sorghum/legume mixture - 1997.
North-West zone
Sudan/Sahel sub-zone — UDU, IAR,
Northern Guinea sub-zone — ATBU, IAR,
Central zone — FUT Minna, IAR & T, ICRISAT,
- (c) Monitoring pest and diseases in the mixtures — 1997.
North West zone
Sudan/Sahel sub-zone — UDU, IAR, ABU, ATBU, I & AR & T
North-West zone — IAR/ATBU
Northern Guinea sub-central zone — FUT Minna IAR & T
- (d) On-farm evaluating of recommended packages - 1998
North-West zone

Sudan/Sahel sub zone — UDU
Northern Guinea sub-zone — IAR, ATBU
Central zone — ICRISAT
Southern Guinea sub-zone — FUT Minna,

South-West zone
Southern Guinea sub-zone — IAR & T
South East zone
Southern Guinea sub-zone — UNN

(e) Determining sowing date model for sorghum legume mixture -1998

North-West zone
Sudan/Sahel sub-zone — UDU, ICRISAT
Northern Guinea sub-zone — IAR, ATBU
Central zone — ICRISAT
Southern Guinea sub-zone — UAM
South-West zone —
Southern Guinea sub-zone — UNN

NCRP-57

THEME 7: Conducting fertilizer trials with emphasis on nitrogen rate cereal/legume.

Tasks

- (a) Identifying sources of nitrogen for cereal/legume mixtures - 1997.
North-West zone —
Sudan/sahel sub-zone — UDU
Sudan Savanna sub-zone — ATBU, ICRISAT
Northern Guinea sub-zone — IAR
North-East zone —
Sudan/Sahel sub-zone — LCRI
Central zone —
Southern Guinea sub-zone — FUT Minna
- (b) Determining optimum rate at nitrogen sources in the cereal /legume mixture - 1998.
North-West zone

Sudan/Sahel sub-zone	—	UDU
North Guinea sub-zone	—	IAR
North-East zone	—	ICRISAT
Sudan/Sahel sub-zone	—	LCRI
Central zone	—	FUT Minna
Southern Guinea sub-zone	—	FUT Minna
(c) Timing of Nitrogen application of cereal/legume mixture - 1997.		
North-West zone	—	UDU, ICRISAT
Sudan/Sahel sub zone	—	IAR
Northern Guinea sub-zone	—	ICRISAT
North East zone	—	LCRI
Sudan sub-zone	—	LCRI
Central zone	—	FUT Minna
Southern Guinea sub-zone	—	FUT Minna
(d) Economics of nitrogen application to the mixture — 1998.		
North-West zone	—	UDU, ICRISAT
Sudan/Sahel sub-zone	—	IAR, ICRISAT
Northern Guinea sub-zone	—	IAR, ICRISAT
Central zone	—	FUT Minna
Southern Guinea sub-zone	—	FUT Minna
(e) monitoring and control of pests and diseases in cereal legume of the mixture - 1997.		
North-West zone	—	UDU, ICRISAT
Sudan/Sahel sub	—	IAR, ICRISAT
Northern Guinea sub-zone	—	IAR, ICRISAT
Central Zone	—	FUT Minna
Southern Guinea sub-zone	—	FUT Minna
(f) On-farm evaluation of promising technology -1998.		
North-West zone	—	UDU, ICRISAT
sudan/sahel sub-zone	—	UDU, ICRISAT
Northern Guinea sub-zone	—	UDU, ICRISAT
Central zone	—	FUT Minna.
southern Guinea sub-zone	—	FUT Minna.

NCRP-S8

THEMES:

Conducting sowing dates and planting pattern for cereal/cereal mixture (sorghum/millet).

Tasks

- (a) Determining optimum sowing dates for sorghum/millet mixture — 1997.
- | | | |
|--------------------------|---|--------------------|
| North-West zone | — | UDU |
| Sahel sub-zone | — | ATBU, ICRISAT |
| Sudan sub-zone | — | ICRISAT, IAR, ATBU |
| Northern Guinea sub-zone | — | ICRISAT, IAR, ATBU |
| North-East zone | — | LCRI |
| Sahel sub-zone | — | LCRI |
- (b) Determining optimum plant arrangement for sorghum/millet mixture -1997.
- | | | |
|--------------------------|---|------------------|
| Northern-West zone | — | LCRI/ICRISAT |
| Sahel sub-zone | — | ATBU, ICRISAT |
| Sudan sub-zone | — | ATBU, ICRISAT |
| Northern Guinea sub-zone | — | ICRISAT, IAR/ABU |
- (c) monitoring pests and diseases in the mixture — 1997.
- | | | |
|--------------------------|---|------------------|
| North-West zone | — | ICRISAT/LCRI |
| Sahel sub-zone | — | ICRISAT/ATBU |
| Sudan sub-zone | — | ICRISAT/ATBU |
| Northern Guinea sub-zone | — | ICRISAT, IAR/ABU |
- (d) On-farm evaluation of recommended packages— 1998.
- | | | |
|--------------------------|---|------------------|
| North-East zone | — | LCRI |
| Sahel sub-zone | — | LCRI |
| North-West zone | — | ICRISAT, ATBU |
| sudan sub-zone | — | ICRISAT, IAR/ABU |
| Northern Guinea sub-zone | — | ICRISAT, IAR/ABU |
| North East zone | — | LCRI |
| Sahel sub-zone | — | LCRI |
| North-west zone | — | ICRISAT, ATBU |
| Sudan sub-zone | — | ICRISAT, ATBU |
| Northern Guinea sub-zone | — | ICRISAT, IAR/ABU |
- (e) Determining sowing date and planting pattern model for sorghum/millet

mixture— 1998	
North-East zone	
Sahel sub-zone	— ICRISAT/LCRI
North-West zone	
Sudan sub-zone	— UDU, ATBU
Northern Guinea sub-zone	— ICRISAT/IAR/ABU.

NCRP-S9

THEME 9: Conducting fertilizer trials with emphasis on nitrogen in cereal/ mixtures.

Tasks

- (a) Identifying the sources of nitrogen for sorghum/millet mixtures —1997.
- | | |
|--------------------------|---------------------|
| North-East | |
| Sahel sub-zone | — LCRI |
| North-West zone | |
| Sudan zone | — ICRISAT/UDU/A/BU |
| Northern Guinea sub-zone | — ICRISAT/IAR/ATBU. |
- (b) Determining optimum rate of nitrogen source in sorghum/millet mixture —1997.
- | | |
|--------------------------|-------------------|
| North-East zone | |
| Sahel sub-zone | — LCRI |
| North-West zone | — ICRISAT |
| Sudan sub-zone | — UDU, ATBU |
| Northern Guinea sub-zone | — IAR/ABU/ICRISAT |
- (c) determining nitrogen effects on phosphorus and potassium in sorghum/ millet mixtures — 1998.
- | | |
|--------------------------|---------------------|
| North-West zone | |
| Sahel/Sudan sub-zone | — UDU |
| Sudan sub-zone | — ICRISAT, ATBU |
| Northern Guinea sub-zone | — ICRISAT/IAR/ATBU. |
- (d) Utilization of nitrogen and phosphorus fertilizers in sorghum/millet mixtures — 1998.
- | | |
|-----------------|-------|
| North-West zone | |
| Sahel sub-zone | — UDU |

Sudan sub-zone	— ICRISAT/ATBU
Northern Guinea sub-zone	— ICRISAT/IAR/ABU
North-East zone	
Sahel sub-zone	— LCRI

- (e) Determining nitrogen and phosphorus requirements of sorghum/millet mixtures — 1998.
- | | |
|--------------------------|-------------------|
| North-West | |
| Sahel sub-zone | — UDU |
| Sudan sub-zone | — ICRISAT/ATBU |
| Northern Guinea sub-zone | — ICRISAT/IAR/ABU |
| North-east zone | |
| sahel sub-zone | — LCRI |
- (f) Monitoring and control of pests and diseases of the mixtures—1997.
- | | |
|--------------------------|---------------|
| North-West zone | |
| Sahel sub-zone | — UDU |
| Sudan sub-zone | — ICRISAT/ABU |
| Northern Guinea sub zone | — IAR/ABU |
- (g) Timing of nitrogen and phosphorus application to the mixture —1998.
- | | |
|--------------------------|-------------------|
| North-West zone | |
| Sahel sub-zone | — UDU |
| Sudan sub-zone | — ICRISAT/ATBU |
| Northern guinea sub-zone | — ICRISAT/IAR/ABU |
- (h) Economics of fertilizer application to the mixture—1998.
- | | |
|--------------------------|----------------|
| North-West zone | |
| Sahel sub-zone | — UDU |
| Sudan sub-zone | — ICRISAT/ATBU |
| Northern Guinea sub-zone | — ICRISAT/ABU |
- (i) On-farm evaluation of promising technology — 1998.
- | | |
|--------------------------|---------------|
| North-West zone | |
| Sahel sub-zone | — UDU |
| Sudan sub-zone | — ATBU/NAERLS |
| Northern Guinea sub-zone | — IAR/ABU |

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RICE AND SOYBEAN

S.M. MISARI, A. A. IDOWU and M.M. UKWUNGWU
National Cereals Research Institute, Badeggi
P. M. B. 8, Bida Niger State

1. RICE

1.1 IMPORTANCE AND PRESENT LEVEL OF DEVELOPMENT AND MAJOR BOTTLENECKS

Rice Area and Production Trends:

Rice is the sixth major crop in acreage after sorghum, millet, cowpea, cassava and yam in Nigeria (Fig 1). It is the only crop which is grown throughout the country, and in all agroecological zones from the sahel to the coastal swamps.

Rice area in Nigeria has tremendously increased since 1989.

The average annual growth rate during 1983 to 1992 was 14.2% (WARDA, 1996). This was primarily due to favourable government policy or ban of rice importation in 1986. This has led to increase in rice production from 0.94 million tonnes in 1986 to 2.54 million tonnes in 1994. The average yield over the years is 1.5t/ha. The yield, however, has not increased appreciably over the 1976 peak of 2.3t/ha (Fig. 2). Thus increase in production is mainly due to expansion in area and not the productivity per unit of land. Potential area for rice cultivation in Nigeria is estimated at 4.6 million ha (FAO, 1978). Still there is vast potential to increase the rice area.

Rice is one of the most preferred food particularly for urban consumer as it is easy to prepare as compared to other traditional foods in Africa. In the rural area, it has become a major cash crop due to its high price as there is preference for traditional food crops for home consumption. Rapid urbanization (35% urban population in 1990) has also led to increased demand for rice which cannot be met by domestic supply at the present due to government support of production in Nigeria. This, coupled with the preference for white